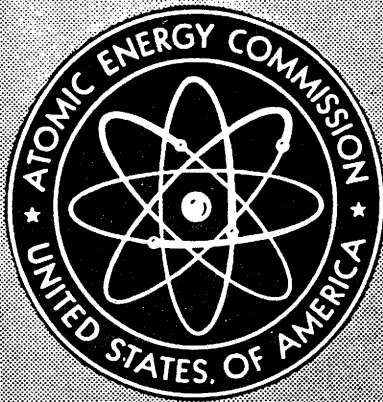


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BIOENVIRONMENTAL FEATURES  
OF THE OGOTORUK CREEK AREA,  
CAPE THOMPSON, ALASKA

A First Summary by The Committee on  
Environmental Studies for Project Chariot

December 1960

Division of Biology and Medicine, AEC  
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BIOENVIRONMENTAL FEATURES  
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OGOTORUK CREEK AREA  
CAPE THOMPSON, ALASKA

A First Summary

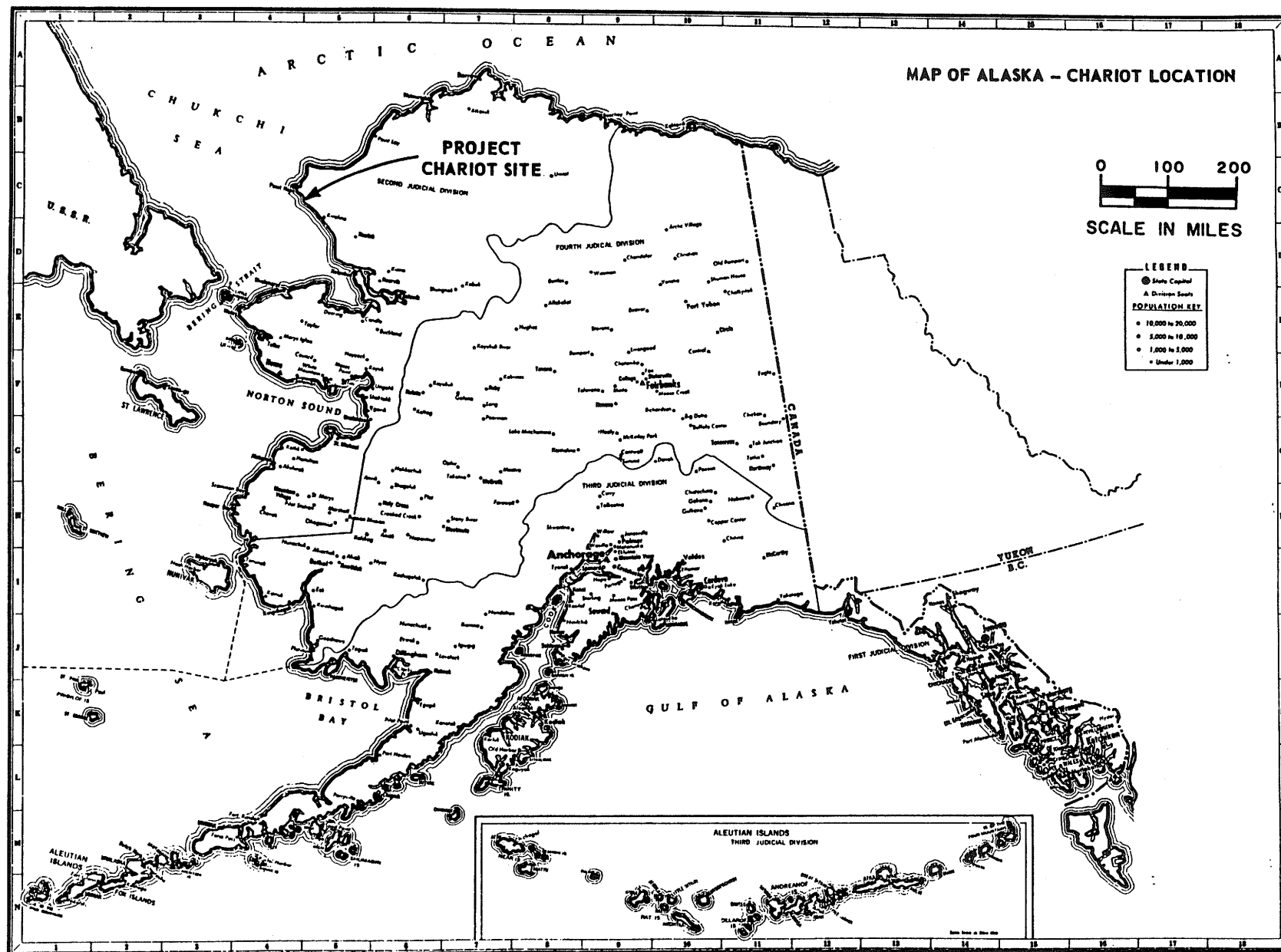
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The Committee on Environmental Studies  
for  
Project Chariot

FLOWSHARE PROGRAM

THE UNITED STATES ATOMIC ENERGY COMMISSION

December, 1960



## FOREWORD

This summary is based on the reports on more than 30 bioenvironmental investigations carried out in the Cape Thompson area in Alaska since late spring of 1959. Final reports of the first year's work and some of the progress reports of the second year of investigation have been utilized in preparing this summary. Most of these studies will be the source of many scientific papers in the years to come and the stimulus for further researches because of numerous problems brought to light. No program of this scope is ever "completed."

This summary has been prepared for the U. S. Atomic Energy Commission by the members of the Committee on Environmental Studies for Project Chariot from the reports listed in Appendix IV. It is intended that a complete scientific report of these studies will be published. The Committee assumes responsibility for inadvertent omissions and will maintain a continuing effort to update this document in order to keep the Commission informed.

The Committee wishes to thank the principal investigators, and their colleagues, not only for their diligent scientific labors, but for their efforts in making their findings available promptly. Their cooperation and achievement in the scientific phases of this program have been noteworthy. Their commentaries on this summary will be sought and will be useful in the preparation of any future revisions.

To Ralph Chase, Holmes and Narver; James Sugden, Myrl Smith, and Henry Schlacks of AEC; Porter Lockard, Wiens Airlines pilot, we express gratitude for cooperation and assistance at the campsite.

Finally, we appreciate the helpfulness of Dr. G. W. Johnson and his scientific staff at the University of California Lawrence Radiation Laboratory; and to many consultants, advisors, authors, and scientists whose contributions go unmentioned here, we express thanks.

This scientific report with committee commentary supersedes all other tentative statements or reports, internal or otherwise, that have been prepared by the Committee on Environmental Studies for Project Chariot.

John N. Wolfe, Chairman  
Allyn Seymour, Deputy Chairman  
Max E. Britton  
Arthur H. Lachenbruch  
Kermit H. Larson  
Robert L. Rausch  
Norman J. Wilimovsky  
Ernest D. Campbell, Secretary

December 20, 1960  
Ed. Rev. March 31, 1961

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## INTRODUCTION

In May, 1959, the United States Atomic Energy Commission approved a program of environmental studies to be conducted in conjunction with a proposed excavation project using nuclear explosives (Project Chariot, Plowshare Program) at the mouth of Ogotoruk Creek in northwestern Alaska.

The proposal, not approved by the Atomic Energy Commission at the time of this report, involves the simultaneous detonation of five nuclear devices. Four 20 KT devices would be buried to about 400 feet, and one 200 KT device buried to about 800 feet. The detonation would be expected to produce a channel about 900 feet wide and about 2000 feet long, with an additional basin of about 1800 feet in diameter resulting from explosion of the larger device. It is expected that about 95 per cent of the fission products will be entrapped underground.

The Commission's decision to conduct pre-detonation bioenvironmental researches provided the first substantial opportunity for scientific appraisal of ecological systems<sup>1/</sup> prior to the detonation of nuclear devices and the chance to provide bioenvironmental baselines by which after-effects could be evaluated and measured. Earlier plans for a continuing environmental investigation in the Chukchi Sea and on the land in the valley of Ogotoruk Creek and adjacent areas near Cape Thompson, Alaska, were set in motion.

Biological considerations in relation to the project were formally inaugurated on March 13, 1958. At that time a Sandia Corporation representative contacted the Division of Biology and Medicine relative to participation by the University of Washington Laboratory of Radiation Biology (UWLRB) in the proposed Alaskan nuclear excavation.<sup>2/</sup>

---

<sup>1/</sup> There was, however, a fish study prior to the 1946 Bikini experiments. An effort was made to determine the populations of fish on the Bikini reefs for the purposes of comparison after the event. The collections resulted in an excellent list of fishes, but efforts to determine population changes could not be achieved because there was insufficient time for pre-shot study.

<sup>2/</sup> The USGS was doing planning work as early as February 1958, and carried out initial field work in the same year directed toward an understanding of the geological environment. Geological work later became a part of the Committee's environmental program.



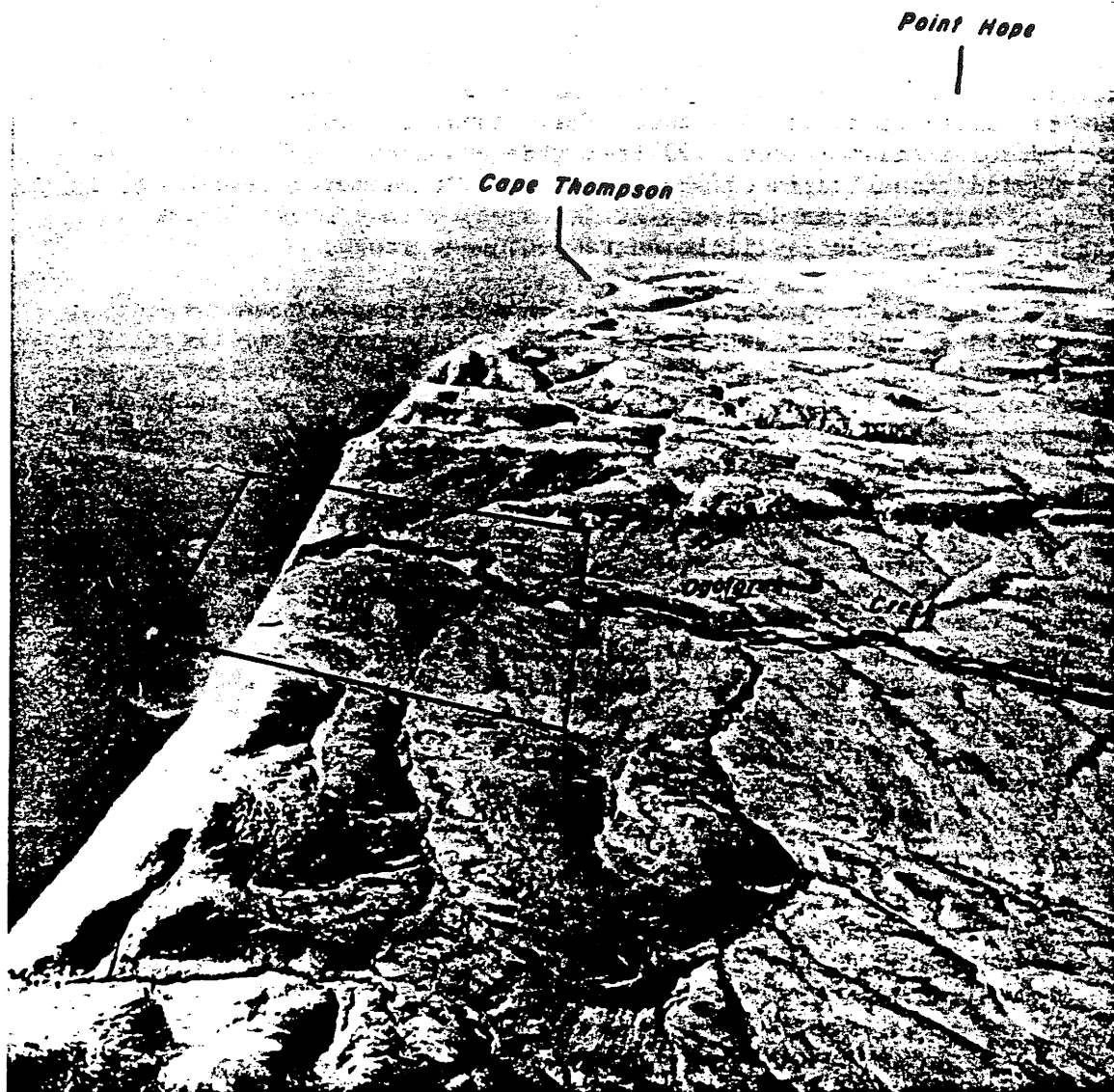


Figure 1. Aerial view of Ogotoruk Valley and Vicinity.



Fig. 2. View of section of bird cliffs at Cape Thompson

On April 8, 1958, a meeting was held at the University of California Lawrence Radiation Laboratory (LRL), Livermore, California, "to outline projects, set dates and locations, and formulate an operations unit." On April 29, 1958, Lauren Donaldson, Director of UWLRLB, outlined a program of biological emphasis which he considered an essential part of the Chariot Project.

A meeting was held in Washington on May 5, 1958, with Atomic Energy Commission representatives and those from the Department of Interior, including Fish and Wildlife, Geological Survey and other agencies of the Department. This meeting was held to consider biological problems relating to the proposed project as well as others, but no formal plans were developed.

The first public announcement of the Plowshare Program was made June 9, 1958, by the Commission.

On August 25, 1958, at the request of the Commission's Division of Biology and Medicine, Dr. M. E. Britton, plant ecologist, Max Brewer, geophysicist, and Dr. Henry Childs, animal ecologist, visited the Ogotoruk Valley, collected some specimens and obtained a large number of photographs. In November 1958, Dr. Britton reported on this reconnaissance before the Advisory Committee for Biology and Medicine. At this same meeting Dr. Allyn Seymour reported on a literature survey that had been carried out in preceding months and discussed the development of the general program outlined earlier by Dr. Donaldson.

On February 20, 1959, another meeting was held at the Lawrence Radiation Laboratory, Livermore, to discuss further the biological implications of the excavation operation. In March a group of University and AEC scientists visited various agencies and organizations in Juneau, Anchorage, and Fairbanks, Alaska, to obtain additional opinions and suggestions relative to an environmental survey of the Chariot Site at Ogotoruk Creek.

A committee (Appendix I) was formed by the Commission's San Francisco Operations Office: to plan the scope of studies necessary to obtain sufficient information for prediction of the effects of the project on the biosphere; to recommend organizations to carry out the investigations (Appendix II); to receive and review reports; to analyze and summarize the findings; and to make further recommendations. The Committee's charter appears as Appendix III.

The objectives of the environmental program are:

1. To become sufficiently familiar with arctic ecological systems in the project area to permit: (a) estimates of the biological cost of the excavation operation, and (b) judgments as to whether or not there will be effects that could result in widespread damage to or major disruption of biological systems.

2. To become sufficiently familiar with the biological and physical environments that the findings can be used as baselines in studies to be conducted in post excavation time.
3. To determine radiation levels and distribution of radioisotopes in the biota and physical environment in pre- and post-detonation time.
4. To conduct all studies in such manner that the results constitute a significant contribution to scientific knowledge.

The scope of the program is outlined in the contents and brief summaries of progress in each area form the body of this report.

As of this time more than 30 studies (Appendix IV) are in varying stages of progress. Descriptive work such as areal geological mapping, cataloging of birds, fishes, mammals, plants, etc., is essentially complete (insofar as it is possible ever to "complete" biological inventories).

On the other hand, investigations of dynamic processes (soil movements, plant and animal migrations, succession, etc.) are continuing and it has been recommended that these receive such support as is necessary to maintain the records unbroken until immediately before detonation, if such is approved.

General Statement. The arctic tundra, circumpolar in extent, is a unique environment on this planet, having no counterpart in the southern hemisphere. Not infrequently it is described as remote, desolate, barren, and climatically rigorous. Probably none of these adjectives is accurate, and very possibly they are misleading.

The tundra is vast in extent, but more uniform in biotic composition, ecological structure, and physiognomy than any other terrestrial biological organization at landscape scale on earth. It is not remote to the Eskimo, the arctic fox, or the ptarmigan; the flowering plants blooming by the thousands per acre in certain areas in brilliant colors during the early growing season, belie its barren-ness and desolation; and the tundra climate is most salubrious to dwellers there, including man.

Ogotoruk Valley and the adjacent Chukchi Sea (see Frontispiece) are the centers of attention in this report. Here, about 100 miles north of the Arctic Circle, 125 miles northwest of Kotzebue, landscapes are dominated by various communities of plants, their constituents all small or dwarfed by genetic and/or environmental conditioning. Predominant are sedges, grasses, heathers, mosses and lichens. These are the

primary food producers of terrestrial habitats and together with algae, the primary producers of the sea, form the broad base for the entire human economy.

The Chukchi Sea is shallow and lies over a floor characterized as the largest area of low relief on earth. In summer inshore temperatures reach 50° F.

The catalog of plants and animals that live all or parts of their lives in this area is already impressive even though the numbers of species in the following lists most certainly will be increased as studies continue.

Of approximately 60 known species of mammals in Alaska, 23, including polar bear, walrus, seals, whales, and caribou are known from this area. There are 280 recognized species of flowering plants. Numbers of species in other groups include 55 freshwater and marine fishes, several of which were not enumerated by a Russian expedition of a quarter of a century ago. Inland birds include 111 species, 58 of which are known to breed in the area. Seven species of cliff birds number almost a quarter million individuals.

Some other groups include: 200 species of marine invertebrates, 680 fresh and brackish water algae, 45 zooplankton, 43 mosses and liverworts, and 58 lichens.

It is from this biota that all the human inhabitants of the area derive most of their living needs, directly or indirectly. Kivalina, 40 miles to the southeast, and Point Hope, 32 miles to the northwest, together have a total population of about 500 people. Noatak, 75 miles to the ESE has a population of about 270 people.

Here at the mouth of Ogotoruk Creek, in a climate characterized by long, cold winters and short, cool, spring-like summers, both marked by high winds, it is proposed to excavate an inlet by means of nuclear explosives, as an experiment in "geographical engineering."

It is with the living aspects of geography and their relations to projects of this magnitude that this first report is concerned.

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